

CLAIMS

1. A power system, comprising:

a first power module comprising a module housing, a cold plate attached to the module housing, a first bus accessible from an exterior of the module housing, a second bus accessible from the exterior of the module housing, the second bus electrically isolated from the first bus, a first set of electrical terminals accessible from the exterior of the module housing, for each of the electrical terminals in the first set of electrical terminals, a number of first leg components electrically coupled between the electrical terminal and the first bus, and a number of second leg components electrically coupled between the electrical terminal and the second bus;

a second power module comprising a module housing, a cold plate attached to the module housing, a first bus accessible from an exterior of the module housing, a second bus accessible from the exterior of the module housing, the second bus electrically isolated from the first bus, a first set of electrical terminals accessible from the exterior of the module housing, for each of the electrical terminals in the first set of electrical terminals, a number of first leg components electrically coupled between the electrical terminal and the first bus, and a number of second leg components electrically coupled between the electrical terminal and the second bus; and

at least one external connector electrically coupling the first and the second buses of the first power module with respective ones of the first and the second buses of the second power module.

2. The power system of claim 1 wherein the first and the second power modules are arranged back-to-back with the cold plate of the first power module facing the cold plate of the second power module.

3. The power system of claim 2, further comprising:
a dielectric interposed between the cold plates of the first and the second power modules.

4. The power system of claim 1 wherein the first and the second buses of the first power module comprise a first bus bar and a second bus bar substantially parallel to and spaced from the first bus bar by a first dielectric, each of the first and the second bus bars comprising at least two terminals extending out of the module housing of the first power module to provide access to the first and the second buses externally from the module housing, and wherein the first and the second buses of the second power module comprise a first bus bar and a second bus bar substantially parallel to and spaced from the first bus bar by a second dielectric, each of the first and the second bus bars comprising at least two terminals extending out of the module housing of the second power module to provide access to the first and the second buses externally from the module housing.

5. The power system of claim 1 wherein the external connector is approximately U-shaped.

6. The power system of claim 1 wherein the external connector is formed as a laminate comprising a first conducting layer, a second conducting layer and at least one electrically insulating layer electrically isolating the first conducting layer from the second conducting layer.

7. The power system of claim 1 wherein the first and the second leg components comprise at least one of an integrated gate bipolar transistor, a metal oxide semiconductor field effect transistor, and a diode.

8. The power system of claim 1 wherein the first power module is operable to passively rectify an alternating current received at the first set of electrical terminals of the first power module and the second power module is operable to invert a direct current received at the first and the second buses of the second power module.

9. The power system of claim 1 wherein the first power module is operable to actively rectify an alternating current received at the first set of electrical terminals of the first power module and the second power module is operable to invert a direct current received at the first and the second buses of the second power module.

10. The power system of claim 1 wherein the first power module is operable to rectify an alternating current received at the first set of electrical terminals of the first power module to provide a direct current on the first and the second buses of the first power module, and wherein the second power module is operable to rectify an alternating current received at the first set of electrical terminals of the second power module to provide a direct current at the first and the second buses of the second power module.

11. The power system of claim 10 wherein the first set of electrical terminals of the first power module comprises six electrical terminals where a first three of the electrical terminals are electrically connected together and a second three of the electrical terminals are electrically connected together, and wherein the first set of electrical terminals of the second power module comprises six electrical terminals where a first three of the electrical terminals are electrically connected together and a second three of the electrical terminals are electrically connected together.

12. The power system of claim 10 wherein the first power module comprises six electrical terminals in the first set of electrical terminals where the six electrical terminals are electrically connected together, and wherein the second power

module comprises six electrical terminals in the first set of electrical terminals where the six electrical terminals are electrically connected together.

13. The power system of claim 1 wherein the first power module is operable to invert a direct current received at the first and the second buses of the first power module to provide an alternating current at the first set of terminals of the first power module, and wherein the second power module is operable to invert a direct current received at the first and the second buses of the second power module to provide an alternating current at the first set of terminals of the second power module.

14. The power system of claim 13 wherein each of the electrical terminals of the first power module is electrically connected to a respective phase of a first load, and each of the electrical terminals of the second power module is electrically connected to a respective phase of a second load.

15. The power system of claim 13 wherein each of the electrical terminals of the first power module is electrically connected to a respective one of the electrical terminals of the second power module.

16. A power system, comprising:
a rectifier power module comprising a module housing, a cold plate attached to the module housing, a set of input terminals, a first output bus and a second output bus;
an inverter power module comprising a module housing, a cold plate attached to the module housing, a first input bus, a second input bus, and a set of output terminals, wherein the cold plate of the inverter power module faces the cold plate of the rectifier power module; and

at least one external connector electrically coupling each of the first and the second output buses of the rectifier power module with a respective one of the first and the second input buses of the inverter power module.

17. The power system of claim 16, further comprising:
a dielectric interposed between the cold plates of the rectifier power module and the inverter power module.

18. The power system of claim 17 wherein the external connector is formed as an approximately U-shaped laminate comprising a first conducting layer, a second conducting layer and at least one electrically insulating layer electrically isolating the first conducting layer from the second conducting layer, the external connector comprising a first arm and a second arm spaced from the first arm sufficiently to receive the rectifier power module and the inverter power module therebetween.

19. The power system of claim 16 wherein the rectifier power module comprises a number of transistors electrically coupled to actively rectify an alternating current received at the set of input terminals.

20. A power system, comprising:
a first rectifier power module comprising a module housing, a cold plate attached to the module housing, a set of input terminals, a first output bus and a second output bus;
a second rectifier power module comprising a module housing, a cold plate attached to the module housing, a set of input terminals, a first output bus and a second output bus, wherein the cold plate of the second rectifier power module faces the cold plate of the first rectifier power module; and

at least one external connector electrically coupling each of the first and the second output buses of the first rectifier power module with a respective one of the first and the second output buses of the second rectifier power module.

21. The power system of claim 20, further comprising:
a dielectric interposed between the cold plates of the first and the second power modules.

22. The power system of claim 21 wherein the external connector is formed as an approximately U-shaped laminate comprising a first conducting layer, a second conducting layer and at least one electrically insulating layer electrically isolating the first conducting layer from the second conducting layer.

23. The power system of claim 22 wherein the first and the second rectifier power modules are configured as an H-bridge.

24. The power system of claim 22 wherein the first and the second rectifier power modules are configured as a half bridge.

25. The power system of claim 22 wherein the at least one of the first and the second rectifier power modules comprises a number of transistors electrically coupled to actively rectify an alternating current received at the respective set of input terminals.

26. A power system, comprising:
a first inverter power module comprising a module housing, a cold plate attached to the module housing, a first input bus and a second input bus, and a set of output terminals;

a second inverter power module comprising a module housing, a cold plate attached to the module housing, a first input bus and a second input bus, and a set of output terminals, wherein the cold plate of the second inverter power module faces the cold plate of the first inverter power module; and

at least one external connector electrically coupling each of the first and the second input buses of the first inverter power module with a respective one of the first and the second input buses of the second inverter power module.

27. The power system of claim 26, further comprising:

a dielectric interposed between the cold plates of the first and the second inverter power modules.

28. The power system of claim 27 wherein the external connector is formed as an approximately U-shaped laminate conforming to at least a portion of an exterior of the first and the second inverter power modules, the U-shape laminate comprising a first conducting layer, a second conducting layer and at least one electrically insulating layer electrically isolating the first conducting layer from the second conducting layer.

29. The power system of claim 28 wherein at least a first, a second and a third one of the output terminals of the first inverter power module is electrically coupled to supply a respective phase of three phase AC power to a first load and at least a first, a second and a third one of the output terminals of the second inverter power module is electrically coupled to supply a respective phase of three phase AC power to a second load.

30. The power system of claim 28 wherein at least a first one of the output terminals of each of the first and the second inverter modules are electrically coupled to supply a first phase of three phase AC power to a first load, at least a second

one of the output terminals of each of the first and the second inverter modules are electrically coupled to supply a second phase of three phase AC power to the first load, and at least a third one of the output terminals of each of the first and the second inverter modules are electrically coupled to supply a third phase of three phase AC power to the first load.

31. A method of forming a power system, comprising:

providing a first power module comprising a module housing, a cold plate attached to the module housing, a first bus accessible from an exterior of the module housing, a second bus accessible from the exterior of the module housing, the second bus electrically isolated from the first bus, a first set of electrical terminals accessible from the exterior of the module housing, for each of the electrical terminals in the first set of electrical terminals, a number of first leg components electrically coupled between the electrical terminal and the first bus, and a number of second leg components electrically coupled between the electrical terminal and the second bus;

providing a second power module comprising a module housing, a cold plate attached to the module housing, a first bus accessible from an exterior of the module housing, a second bus accessible from the exterior of the module housing, the second bus electrically isolated from the first bus, a first set of electrical terminals accessible from the exterior of the module housing, for each of the electrical terminals in the first set of electrical terminals, a number of first leg components electrically coupled between the electrical terminal and the first bus, and a number of second leg components electrically coupled between the electrical terminal and the second bus;

and

externally electrically coupling the first and the second buses of the first power module with respective ones of the first and the second buses of the second power module.

32. The method of claim 31 wherein externally electrically coupling the first and the second buses of the first power module with respective ones of the first and the second buses of the second power module comprises attaching an external connector between the first buses of the first and the second power modules and attaching the external connector between the second buses of the first and the second power modules.

33. The method of claim 31 wherein externally electrically coupling the first and the second buses of the first power module with respective ones of the first and the second buses of the second power module comprises attaching an approximately U shaped external laminate connector conforming to an exterior of the first and the second power modules between the first buses of the first and the second power modules and attaching the U shaped external laminate connector between the second buses of the first and the second power modules.